

## Assessment of the Prevalence of Hypertension and Associated Factors Among Ethiopian Federal Police Officers Addis Ababa, Ethiopia: A Community Based Cross-Sectional Study

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### Abstract

Hypertension affects an estimated one billion people worldwide in 2013. Now a day, it is a public health challenge characterized by increased morbidity, mortality, as well as cost to the community and health systems in general population and affects the justice system by reducing the man power in police institutions. The goal of this study is to assess the prevalence of hypertension and associated risk factors among police officers in Addis Ababa Ethiopia.

**Methods:** A cross-sectional study design was conducted in Addis Ababa Ethiopia from September to October 2015 by using the World Health Organization STEPwise approach to chronic non-communicable diseases surveillance (WHO STEPS). Systematic random sampling methods were employed to select police officers aged between 18 - 58 years by using from their registration book. 584 police officers were participated in this study. Demographic and socio-economic variables were collected via individual interviews using the WHO STEPS survey, after which blood pressure and blood samples were collected. Bivariate and multivariable analyses were performed to explore the association between hypertension and associated factors.

**Result:** Out of the 630 eligible subjects, 584 (92.7%) police officers have participated in this study. The prevalence of hypertension was 17.8%. Having history of first degree relative who suffered from either hypertension or diabetes, year of service, Diabetes Mellitus, increased waist circumference were found to have a statistical significance with the prevalence of hypertension.

**Conclusion:** Further research and Preventive measure will be needed to reduce modifiable risk factor and to delay the onset of non-modifiable risk factors of hypertension among study participant by Ethiopian Federal police institutions, ministry of health and other partners who works in collaboration with police institutions.

**Keywords:** *Associated Factors; Hypertension; Ethiopian Federal Police Commission; Addis Ababa; Prevalence*

### Abbreviations

AAU: Addis Ababa University; AOR: Adjusted Odds Ratio; BMI: Body Mass Index; COR: Crude Odds Ratio; DM: Diabetes Mellitus; HTN: Hypertension; WC: Waist Circumference; WHO: World Health Organization; WHR: Waist Hip Ratio

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## **Introduction**

Globally nearly 9.4 million peoples dies every year due to high blood pressure, and it is one of the most important causes of premature death [1,2]. Complications and burden from raised blood pressure is also growing worldwide, affecting approximately one billion people, a figure that is predicted to increases; especially in low, lower middle income countries than high income countries [3-9].

The present trend in increment of hypertension seen in some occupational group globally, among these occupational group police officers; are predisposed to those factors which leads to the development of hypertension and other cardiovascular diseases [10-15]. Hypertension is a chronic non-communicable disease having modifiable and non-modifiable risk factors reported in many studies such as family history, race, genetics, old age, cigarette smoking, alcohol intake, obesity, physical inactivity, lifestyle, excessive salt, and dietary habits [16-21].

Due to the fact that high priority is given to the investigation of communicable disease; in Ethiopia, there is scarcity of data on prevalence and associated factors of hypertension in general population and particularly among those vulnerable group who are predisposed to hypertension and other cardiovascular disorder than the general population. Therefore, the purpose of this study is to estimate the burden of hypertension and associated risk factors among the Ethiopian police officers. This information is essential for the institutions of police in the country that will helps to generate clue to compact the burden of hypertension by identifying those risk factors predisposed to hypertension and the study also help to support strategic decisions such as resource allocation and public health interventions to reduce risk factors and decrease the burden of disease.

## **Materials and Methods**

### **Study Area**

The study was conducted in Addis Ababa city, the capital of Ethiopia, with a population of 3,048,631 and total area of 540 km<sup>2</sup>. It is a metropolitan city currently structured in ten sub-municipalities (Kifle Ketemas) and 203 districts (Woredas) [22].

### **Study Design and Period**

The study used a community based cross-sectional study design conducted from September to October 2015.

### **Source population**

All Ethiopian Federal police commission officers who live and work in Addis Ababa.

### **Study Population**

Federal Police commission officers who live in Addis Ababa and fulfilled the inclusion criteria.

### **Sample Size**

Sample size was determined by using the single proportion formula and due to lack of studies on similar population group in Ethiopia by taking P = 50%.

$n = (Z_{\alpha/2})^2 p(1-p) / d^2$  where;

$\alpha = 0.05$  or  $Z_{\alpha/2} = 1.96$ ,  $p = 0.5$ ,  $d = 0.04$

$n = (1.96)^2 0.5(1-0.5) = 600$

0.042

By adding 5% non-response rate, the final sample size was;  $600+600 \times 0.005 = 630$  subjects.

### **Sampling Procedures**

A systematic sampling technique was employed in order to select a representative sample of respondents from the study population. At first, lists of all police officers were obtained from their registration book. Then respondents were selected using a systematic random sampling from the sampling frame.

### **Data Collection Procedure**

A three-days training on interviewing technique, questionnaire administration and physical measurement techniques, were given to the data collectors a five days before the actual survey. Data was collected by four nurses, two health officers and two-laboratory technicians.

Socio-demographic data and relevant behavioral and life style characteristics were recorded in pre-tested questionnaires.

Participants were informed about the purpose of the study through the data collectors to enhance maximum participation. Those who had agreed to participate were requested to be registered at the office and were informed when to undergo an overnight fasting before their test. Then, anthropometric measurements and biochemical tests were taken and advice was recommended for each participant.

### **Definition of Variables**

**Police officer:** An individual who had taken at least 6 months of police training and working within the Federal Police Commission.

**Rank:** A designation given to police officers based on service year, professional qualification in education or work efficiency.

**Lower rank:** A category of the ranks from 'Constable' to 'Chief Sergeant'.

**Middle rank:** A category of the ranks from 'Assistant Inspector' to 'Inspector'.

**Higher rank:** A category of the ranks from 'Chief Inspector' to 'General Commissioner'.

**First degree relative who suffered from diabetes and/ hypertension:** A previous history of the respondent's father, mother, full brother or sister had diabetes and/ hypertension.

**Current smoker:** An individual who reported smoking during the time of the study.

**Current drinker:** An individual who were alcohol drinker during the time of study.

**Low consumption of vegetable and fruits:** An individual who do not consume fruits and vegetables daily.

**Diabetes mellitus:** A fasting capillary whole blood glucose value equal to or greater than 6.1 mmol/l ( $\geq 110$  mg/dl).

**Hypertension:** The average systolic blood pressure readings  $\geq 140$ mmHg and/or diastolic blood pressure readings  $\geq 90$ mmHg.

**Vigorous physical activity:** An individual who reports that their work involve vigorous activities, like heavy lifting, digging at least 30 minutes three times per week.

**Centrally Obese:** An individual whose waist circumference measurement is  $\geq 85$  cm for female and  $\geq 102$  cm for male.

**Data Quality Management**

The study used a modified form of the WHO Global Risk Factor Surveillance Questionnaire [23]. Pretest was carried out to ensure suitability of the questionnaires for the survey. An Amharic translated version of the questionnaire was used during the study. Physical measurements were recorded twice and in some case three times in order to minimize observer error in measurements and records, whereas, rotation of data collectors was done to compare values. The sphygmomanometer used in the field was checked before and after data collection each day. The glucometer device and strips were checked periodically for consistency in reference and test reading. Cleaning, Coding and recording of the data collected was done each day.

**Data Analysis**

Data were entered into SPSS version 20.0, cleaned manually and analyzed. Frequency distributions and percentage tables were used to show results of univariate analysis. Cross tabulation, and 95% confidence interval was used to present results of bivariate analysis. Multivariate logistic regression analyses were done to control potential confounding variables.

**Results**

Out of the 630 eligible subjects, a total of 584 (92.7%) police officers aged from 18-58 years have participated in this study. Forty-six or 46 (7.3%) did not involve in this study.

**Socio-demographic characteristics**

Among the total respondents, 464 (79.5%) were males and 120 (20.5%) were females, with a male to female ratio of 4:1. The age of the study participants ranged from 18 to 58 years, with a mean and median age of 30 ± 8.923 and 27.0 years respectively. Majority of the respondents were lower rank police officers which constituted 438 (75%), followed by middle rank accounting of 85 (14.6%) subjects.

Three hundred eighty-three (65.6%) of the study subjects served the police commission below 10 years, followed by 103 (17.6%) and 98 (16.8%) who served from 11 - 20 years and greater than 20 years respectively. Majority (64.4%) of the respondents belong to the orthodox Christian religion.

More than half (54.1%) of the study participants were single. However, there were also a high proportion (41.3%) married respondents. The rest 27 (3.6%) were divorced, separated or widowed. Forty-six (7.9%) of the study subjects have first degree relative who suffered from either hypertension or diabetes mellitus (Table 1).

Characteristics	Number	Percent
Gender		
Male	464	79.5
Female	120	20.5
Age		
< 25	226	38.7
25 - 34	204	34.9
35 - 44	92	15.8
≥ 45	62	10.6
Police Rank		
Lower rank	438	75
Middle rank	85	14.6
Higher rank	61	10.4
Years of service		
1 - 10	383	65.6
11 - 20	103	17.6
> 20	98	16.8
Religion		
Orthodox Christian	376	64.4
Protestant	128	29.9
Muslim	71	12.2
Other	9	1.5
Marital status		
Single	316	54.1
Married	241	41.3
Others	27	4.6
History of 1 <sup>st</sup> degree relative suffered from diabetes or hypertension		
Yes	46	7.9
No	538	92.1
Education level		
Secondary school	406	69.5
College & University	178	30.5
Income level <sup>b</sup>		
<1500	188	32.2
1500-3199	299	51.2
≥3200	97	16.6

**Table 1:** Socio-demographic characteristics of study participants in Federal Police Commission; October 2015, Addis Ababa, Ethiopia (n = 584). Measure is in Ethiopian Birr [ETB]

### Behavioral characteristics of the study participants

Overall, 41 (7%) of the study participants reported that they had history of smoking cigarettes in their life time, out of which 26 (63.4%) were current smokers. Among current smokers, majority (73.1%) were daily smokers. Approximately 34% of the current smokers just smoked cigarettes for 10 or more years and the number of cigarettes smoked ranged from 1 - 10 sticks per day, with a mean of 4 cigarettes per day. The numbers of participants who have ever chewed khat (stimulant leaf) were 74 (12.7%).

Among the study subjects, 402 (69%) had ever consumed alcohol in their life of which 396 (98.3%) were current drinkers. Of those who ever consumed alcohol, 45.1% drink alcohol less than three days a month, followed by 162 (24.6%) from 1 - 4 days per week. Majority (87.8%) of the study participants do not eat vegetables and fruits every day.

Overall, 283 (48.5%) of the study participants were inactive towards physical activity. The prevalence of physical inactivity increased with age from 35.8% among 18 - 24 years to 77.2% among those aged  $\geq$  45 years (Table 2).

Characteristics	Number	Percent
Ever smoker		
Yes	41	7
No	543	93
Current smoker		
Yes	47	74.6
No	16	25.4
Chew Khat		
Yes	74	12.7
No	510	87.3
Ever taken alcohol		
Yes	402	69
No	182	31
Low consumption of fruits and Vegetables		
Yes	513	87.8
No	71	12.2
Vigorous physical activity		
Yes	301	51.5
No	283	48.5

**Table 2:** Behavioral characteristics of study subjects in Federal Police Commission; October 2015, Addis Ababa, Ethiopia (n = 584).

Overall, 449 (76.9%) of the study participants had body mass index (BMI) < 25 kg/m<sup>2</sup>. Out of the rest 135 (23.1%) study subjects who had BMI  $\geq$ 25.0 kg/m<sup>2</sup>, 120 (88.9%) were overweight and 15 (11.1%) were obese.

### Prevalence of hypertension

Of the total participants who were measured for their blood pressure, 162 (17.8%) had hypertension. Out of the study participant with hypertension, 34 (19.32%) were already known hypertensive whereas the rest 142 (80.68%) did not know their status making the ratio of diagnosed to undiagnosed hypertension 1:4.

### Multivariate association of risk factors with hypertension

From the multivariate logistic regression analysis, it was shown that study respondents with increasing waist circumference were found to be 3.7 times at increased risk of having hypertension than participants with lower waist circumference, (AOR = 3.7 95% CI; 2.0 - 6.9). Having history of first degree relative who suffered from either hypertension or diabetes were found to be 2.3 times more likely to have hypertension (AOR = 2.3, 95% CI; 1.1 - 5.0). Increasing years of services showed a significant increase in the prevalence of hypertension (AOR = 3.7, 95%CI; 1.1 - 14.0). Age, police rank, ever smoked, chewing Khat, alcohol consumption, Fruit and vegetable consumption and physical activity did not show any significant association with the prevalence of hypertension.

Study participants with diabetes mellitus were found to be 2.9 times at risk of having hypertension than the participants with normal blood glucose level (AOR = 2.9, 95% CI, 1.4 - 5.9). Waist hip ratio and BMI were found to have no statistical significance with prevalence of hypertension (Table 3).

Characteristics	Presence of Hypertension		COR	AOR
	Yes (%)	No (%)		
Age				
< 25	18 (8.0)	208 (92.0)	1.00	1.00
25 - 34	31 (15.2)	173 (84.8)	2.1 (1.1 - 3.8)	1.6 (0.8 - 3.1)
35 - 44	22 (23.9)	70 (76.1)	3.6 (1.8 - 7.2)	0.9 (0.3 - 3.3)
≥ 45	33 (53.2)	29 (46.8)	13.1 (6.6 - 26.3)	1.5 (0.4 - 6.5)
Police rank				
Lower rank	54 (12.3)	384 (87.7)	1.00	1.00
Middle rank	20 (23.5)	65 (76.5)	2.2 (1.2 - 3.9)	1.0 (0.4 - 2.1)
Higher rank	30 (49.2)	31 (50.8)	6.9 (3.9 - 12.3)	1.2 (0.5 - 3.3)
Years of service				
1 - 10	39 (10.2)	344 (89.8)	1.00	1.00
11 - 20	18 (17.5)	85 (82.5)	1.9 (1.01 - 3.43)	1.4 (0.6 - 3.5)
>20	47 (48.0)	51 (52.0)	8.1 (4.9 - 13.6)	3.7 (1.1 - 14.0)*
First degree relative				
Yes	18 (39.1)	28 (60.9)	4.0 (1.5 - 10.7)	2.3 (1.1 - 5.0)*
No	86 (16.0)	452 (84.0)	1.00	1.00
History of Smoking				
Yes	12 (29.3)	29 (70.7)	2.0 (1.0 - 4.1)	1.4 (0.5 - 3.9)
No	92 (16.9)	451 (83.1)	1.00	1.00
Chewing Khat				
Yes	17 (23.0)	57 (77.0)	1.5 (0.8 - 2.2)	0.9 (0.4 - 2.0)
No	87 (17.1)	423 (82.9)	1.00	1.00
Alcohol consumption				
Yes	78 (19.4)	324 (80.6)	0.7 (0.5 - 1.1)	1.2 (0.7 - 2.2)
No	26 (14.3)	156 (85.7)	1.00	1.00
Vigorous Physical Activity				
Yes	6 (12.0)	265 (88.0)	1.00	1.00
No	68 (24.0)	215 (76.0)	2.3 (1.5 - 3.6)	0.9 (0.5 - 1.6)
DM				
Yes	33 (57.9)	24 (42.1)	8.8 (4.9 - 15.8)	2.9 (1.4 - 5.9)*
No	71 (13.5)	456 (86.5)	1.00	1.00
BMI				
< 25	57 (12.7)	392 (87.3)	1.00	1.00
25 - 29.9	40 (33.3)	80 (66.7)	3.4 (2.2 - 5.5)	1.5 (0.9 - 2.7)
≥ 30	7 (46.7)	8 (53.3)	6.0 (2.1 - 17.2)	2.2 (0.9 - 2.7)
WHR				
Obese	16 (57.1)	12 (42.9)	7.1 (3.2 - 15.5)	2.2 (0.8 - 6.0)
Normal	88 (15.8)	468 (84.2)	1.00	1.00
Centrally Obese				
Yes	62 (41.3)	88 (58.7)	3.4 (2.2 - 5.5)	3.7 (2.0 - 6.9)*
NO	42 (9.7)	392 (90.3)	1.00	1.00

**Table 3:** Multivariate associations of socio - demographic, behavioral, and anthropometric measurement characteristics with hypertension among study participants in Federal Police Commission; October 2015, Addis Ababa, Ethiopia (n = 584).

\*significantly associated

## Discussion

The prevalence of hypertension in the present study was, 17.8%. The prevalence of this finding is comparable to a systematic Meta-analysis conducted by Kibert, *et al.* in 2015 which showed 19.8% prevalence of hypertension among Ethiopian population [24] and Gudina, *et al.* that reported 16.9% prevalence of hypertension in Bedele town, South West, Ethiopia [25]. In contrast to this study higher prevalence of hypertension 42.7%, 34.5%, 31% and 28.4% were reported by Tagurum YO, *et al.* among Adult in a rural community in Plateau state Nigeria [26], Ganesh KS, Naresh AGV, Bammigati C among police personnel in urban Puducherry India [10], B. Sacdevan among Nomad tribe groups of Rajasthan, India [20] and Khwaja Mir Islam Saeed in Jalabad city [21] respectively. There is also lower prevalence of hypertension 14.1% and 14.4% were reported by Jugal Kishare, *et al.* in rural Delhi [27] and Ekpenyong CE, Udokang NE and Akpan EE [6] respectively.

Higher proportions (80.98%) of participants with hypertension were unaware of their blood measurement before the study conducted and the ratio of those diagnosed with undiagnosed hypertension was 1:4. This is similar to many study conducted in developing countries [5,7,8,11,12,28-30] this is may be due to the priority given to infectious diseases and other communicable diseases in the developing countries and in the police department.

This study found a significant increase in the prevalence of hypertension with waist Circumference and this finding is similar to study conducted by Sen et al among Kolkata based policemen [11], Singh S, Dubey DK, Kushware [31], Ganesh KS, Naresh AGV, Bammigati C among police personnel in urban puducherry in India [10], Gudina, *et al.* in Bedele town, Southwest Ethiopia [25] and B Sachdev among Nomad Tribe groups of Rajasthan, India [20]. Year of service in this study was found to have a significant association with the prevalence of hypertension. This is similar to study conducted among Police Personnel in a District of West Bengal, India [32] and Fikenzer, *et al.* among young police officers [33].

This study found a significant increase in the prevalence of hypertension with Diabetes Mellitus. This finding is similar to the study conducted by Oliveira GF, Oliveira TRR, Ikejiri AT, Andraus MP, Galvao TF, *et al.* in an Indigenous Community of Central Brazil [17] and study conducted by Yadav *et al* in an affluent north Indian population [19].

In this study, participants having first degree relative who suffered from either DM or HTN (hypertension) were found to have significantly associated with Hypertension. This is also similar to study conducted by Costa, et al a population based study in Pelotas, Brazil [18], Oliveria GF, Ikejin AT, Andraus MP, and *et al* in an indigenous community of central Brazil [17] and Awoke A, Awoke T, Alemu S and et al among adult in Gonder, Northwest Ethiopia [28]. In contrast to this study there were no significant association of prevalence of hypertension were found with having of history of first degree relative who suffered from either hypertension or diabetes mellitus study conducted by Yadav, *et al.* [19], Khwaja Mir Islam Saeed in Jalabad city [21] and Gudina, *et al* [25].

There were no statistical significance were found in prevalence of hypertension with age, police rank, BMI, WHR and physical activity in this study.

## Conclusion

The study finds a higher prevalence of hypertension and higher proportion of undiagnosed hypertension than diagnosed hypertension among study participants. The significant factors that were associated with prevalence of HTN were; waist circumferences, increasing years of service, Diabetes mellitus and having history of first degree relative who suffered either from hypertension or diabetes mellitus. Further research and Preventive measure needed to reduce modifiable risk factor and to delay the non-modifiable risk factors of hypertension among study participant by Ethiopian Federal police institutions, ministry of health and other partners who works in collaboration with police institutions.

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## Conflict of Interest

The author declares that there is no competing interest.

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